UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

MAY 0 3 2017

Mr. Dennis W. McKinney
Senior Director, Corporate EHS and Global Citizenship
Fortune Brands Home and Security
520 Lake Cook Road
Deerfield, Illinois 60015

RE: Revised Remedy Implementation Plan for the Former Waterloo Industries Facility,
300 Ansborough Avenue, Waterloo, Iowa, February 8, 2017
EPA ID # IAD005277959

Dear Mr. McKinney:

The U.S. Environmental Protection Agency Region 7 has reviewed the subject document, received February 9, 2017. Because of the complexity of the approval process for this document, and a desire to support Fortune Brands beginning the fieldwork to implement this remedy as soon as possible, the EPA is commenting on and approving the document in stages as the reviews of separate sections are complete.

The cost estimate in Appendix F of the RIP cannot be approved as provided. Based on the enclosed independent third-party evaluation of the cost estimate using RACER software, the total cost of $740,189 is likely substantially less than the actual costs to implement the remedy. The independent cost estimate of $1,159,186 is higher primarily because of an assumed longer period of remedy operation (five years rather than three) and higher estimated annual monitoring costs. The EPA believes this higher value better reflects uncertainties in system performance over time and in the calculated individual line-item costs that make up the estimate.

The EPA requests that you revise the cost estimate in Appendix F of the RIP to better reflect the uncertainties summarized in this letter and detailed in the enclosed third-party cost estimate. Alternatively, you may simply adopt the attached third-party cost estimate and revise Appendix F of the RIP to include it. If you choose to revise your cost estimate and calculate a cost that is substantially less than the independent cost estimate, you should thoroughly document the differing assumptions, uncertainties and values used in your estimate to justify your calculated cost.

Annual reviews of the amount of financial assurance will be required during the period of remedy construction and operation. During these reviews, as the work is performed and uncertainties in the cost estimate are reduced, the EPA will entertain requests to reduce the amount of financial assurance that is required for this facility.

RCRA 05/03/2017

561787

Please provide a revised Appendix F to the RIP incorporating these changes within 30 days of your receipt of this letter. If you have any questions, please call me at (913) 551-7324.

Sincerely,

Daniel Gravatt, P.G.
Project Manager
RCRA Corrective Action and Permits Section
Waste Remediation and Permitting Branch
Air and Waste Management Division

Enclosure

cc: Mark Seaman, ERM
Amie Davidson, IDNR

DRAFT TECHNICAL REVIEW OF THE COST ESTIMATE FOR THE WATERLOO INDUSTRIES FACILITY, WATERLOO, IOWA
April 20, 2017

Task Order:	Task Order 3739; Draft Technical Review and Independent RACER® Cost Estimate for Waterloo Facility, Waterloo, IA
	Task 3: Draft Cost Estimate Analysis Report
Deliverable:	REPA5-4739-101
Site:	Waterloo Facility, Waterloo, IA, EPA ID No. IAD005277959

INTRODUCTION

The United States Environmental Protection Agency (USEPA) Region 7, tasked Booz Allen Hamilton (Booz Allen) to perform a technical review and evaluation of the reasonableness of the cost estimate associated with the Remedy Implementation Plan (RIP) for the Former Waterloo Industries Facility (Waterloo Facility) in Waterloo, Iowa. The RIP was prepared by Environmental Resources Management (ERM), Inc., and is dated 8 February 2017. This technical review and evaluation includes both a written analysis of the reasonableness of the cost estimate for implementing corrective action at the Waterloo Facility, as well as a comparison to an independent cost estimate prepared using the Remedial Action Cost Engineering and Requirements (RACER®) software, based on the details of the remedy presented in the RIP.

Part 1: Summary of Corrective Measures

The Remedy Implementation Plan dated 8 February 2017 outlines the following corrective measures for environmental impacts at the Waterloo Facility:

Unsaturated Soil:

- Operate a dual-phase vacuum extraction (DPVE) system to remediate the absorbed residual source of VOCs by extracting vapors from the shallow soil beneath the building slab at AOC 5

Vapor Intrusion:

- Operate the DPVE system to maintain a negative pressure beneath the building slab to prevent vapor intrusion (including start-up testing of exhaust vapors and ambient air)

- Install a separate sub-slab depressurization system (SSDS) specifically to provide soil vapor mitigation until such time that groundwater concentrations are reduced, eliminating the need for the SSDS.
    - Limited coverage area around supervisor's office, east of well MW-9
    - Operate until groundwater Remedial Action Objectives (RAOs) have been achieved
    - Performance sampling to include soil vapor, indoor air, and outdoor air

Groundwater:

- Operate the same DPVE system to remove contaminated groundwater in the highest concentration portion of the impacted area beneath the building slab in AOC 5
- Semi-annual groundwater sampling to evaluate the system effectiveness and whether natural attenuation (NA) is occurring

Institutional Controls:

- Implement ICs through environmental covenants to include the following
    - Restrict land use to non-residential purposes;
    - Prohibit the use of groundwater;
    - Provide notice to EPA for construction projects involving excavation or de-watering in the vicinity of AOC 5
    - Provide notice to EPA for construction projects involving disturbance of surface soil contaminated with PAHs above Regional Screening Levels (RSLs) north of the main facility building (a former wastewater treatment area)
    - Maintain the concrete slab of the building to serve as an engineered cap preventing exposure to contaminated soil beneath the slab

Part II: Independent Cost Estimate for the Waterloo Facility

To aid in analysis of the ERM cost estimate for the Waterloo Facility presented in the RIP, and at the request of the client, Booz Allen has prepared an independent cost estimate for completion of the corrective measures at the Waterloo Facility as described in the RIP. The parameters and assumptions included in the cost estimate are described below. The tasks described align to the tasks identified in the contractor's cost estimate (RIP, Appendix F, Table 2), which are:

Task 1: Remedy Construction

- Pilot Testing
- Construction of full system

Task 2: Remedy Monitoring

- Groundwater, soil vapor, indoor air, and effluent monitoring, reporting and data management
- Monitoring of ICs
- Maintenance of the remedial systems
- Maintenance of the monitoring network

Task 3: Site Closure Activities

- Monitoring well closure

The Waterloo Facility's Remedy Implementation Plan and corresponding cost estimate include the following activities:

- Pilot testing following by construction of full system in one year
- For 3 years, operate and maintain the DPVE system
- For 5 years, operate and maintain the SSDS system
- For 5 years, perform semi-annual soil vapor, indoor air, groundwater, and effluent sampling and reporting and maintain the monitoring network
- For 5 years, monitoring ICs

Booz Allen's cost estimate includes the following specific requirements, based on details provided in the RIP regarding remedy design, construction, and operations. Where the facility did not provide information to prepare a cost estimate, Booz Allen made assumptions based on subject matter expertise with similar RCRA corrective action cleanup enforcement efforts.

Task 1: Remedy Construction

Details of the DPVE System Components

- Pilot test to be conducted to finalize the preliminary design presented in the RIP
- The system will be designed with targeted extraction points placed in a grid surrounding monitoring well MW- 9
- DPVE start up testing will include exhaust vapor sampling and ambient air sampling
- 8 recovery wells in two zones, each with a radius of influence (ROI) of 25 feet. Estimated airflow rate of 40 scfm per well.
- Vacuum measurement and flow control devices
- Primary 6-inch header pipe connected two 4-inch zone headers with separate controls
- Liquid ring vacuum pump capacity 32 scfm at 25 in. Hg
- Air Water Separator (AWS)
- Water storage tank

- Liquid bag filters
- Carbon absorption vessels
- Process transfer pump
- Float switch assembly
- Locking control panel, air/air heat exchanger
- Vacuum, flow, and temperature measurement devices and sample collection ports
- Groundwater design flow rate 0.1 to 0.25 gps
- Spent carbon disposal
- Operational flow rate assumed 0.1 to 0.25 gpm following initial dewatering

Details of the SSDP Components

- Pilot testing of system has already concluded and is basis of current design
- Area of coverage is 244 square feet
- One sub-slab suction point 1 foot by 1 foot by 1 foot
- Extraction point consisting of 4-inch ID Schedule 50 PVC and transfer piping consisting of 3-inch ID Schedule 40 PVC
- Extraction point control assembly (valve, gauges, etc.)
- Blower fan, roof penetration, and exhaust vent stack
- Four vacuum monitoring points drilled into concrete slab suing hammer drill Vapor Pin (trademarked) fitted with a silicone sleeve
- Seal all visible floor cracks
- No air emission control needed

Establish ICs through Environmental Covenants

- Restrict land use to non-residential
- Prohibit use of groundwater

Task 2: Remedy Monitoring
The Waterloo Facility cost estimate outlines the following activities:

Groundwater Monitoring:

- Semi-annual groundwater sampling of 24 monitoring wells. There are 24 monitoring wells total present at the Waterloo Facility – six (6) perched and 18 bedrock wells. Sample for VOCs using Method 8260B.
    1. Of the 24 wells, seven (7) wells (four (4) perched and three (3) bedrock) will be sampled annually for geo and biochemical data in addition to VOCs using Method 8260B. Specific analyses are listed in Table 5-4 of the RIP.
- Assume perched well depth at 10 feet and bedrock well depth at 40 feet.
- Low flow sampling
- QA/QC Sampling
    1. Trip blanks: one (1) per cooler
    2. Field blanks: one (1) per 20
    3. Equipment rinsate blanks: one (1) per 20
    4. Duplicates: one (1) per 10
    5. MS/MSD: one (1) per 20
- Data evaluation and annual reporting, including trend analysis and statistics
- Investigative-Derived Waste (IDW) – standard waste profiling, characterization, and disposal

SSDP Monitoring:

- Four total air samples analyzed semi-annually for VOCs (TO-15)
    1. Two (2) sub-slab samples
    2. One (1) indoor air sample
    3. One (1) outdoor air sample
- Data evaluation and reporting to include the following:
    - SSDS system operational data
    - A discussion of observed system influence based on differential pressure readings. Recommendations for system modifications to improve system efficiency (if applicable)

DPSE Operations and Monitoring: Startup and O&M Components:

- One pair of effluent air samples (one before and one after the carbon vessels) analyzed for TO-15
- Effluent sampling frequency—8 hours, one day, one week, one month, then monthly
- Monitoring report—quarterly for the first year, then annually to include the following:
    - DPVE effluent monitoring data
    - Evaluation of the carbon treatment system performance; DPVE system
    - Operational data
    - DPVE mass-removal calculations
    - Time-series concentration graphs
    - Evaluation of system efficiency
    - Recommendations for system modifications

Monitoring of LUCs:

- Provide EPA notice for construction projects involving excavation and de-watering
- Maintain concrete slab as engineered cap- replace any parts of slab removed during DPSE system installation
- Notice letter and site visit, annually, to be conducted in concert with monitoring events

Reporting:

- Reporting of all individual monitoring components listed will be combined in one report for the annual report. Quarterly system O&M reports will be issued separately.

Task 3: Site Closure Activities

- Work Plan for verifying RAOs through soil and groundwater sampling
- Verification soil sampling at four locations using direct push sampling after groundwater has achieved the RAOs; four confirmation samples collected at 5 ft. bgs and analyzed for VOCs EPA method 8260C
- Post-DPVE shutdown effluent sampling of effluent for 3 quarters while SSDS continues to operate
- Shutdown of SSDS one year after the DPVE system
- Closure reports and notices

- The RIP indicates well decommissioning of 16 monitoring wells (assumed in-place abandonment) included in the Waterloo Facility estimate
    1. The RACER cost estimate includes abandonment of the following wells, based on the assumption that all components will require abandonment upon site closure:
        - Eight (8) DPVE wells (20 ft. depth, 2 in. diameter)
        - 15 deep wells, including well pairs MW-1, MW-2, and MW-2d, which are paired, perched-bedrock screens installed in a single well location (45 ft. depth, 2 in,. diameter)
        - Seven (7) shallow wells (25 ft. depth, 2 in. diameter)
- Letter report presenting all supporting data verifying achievement of RAOs

Waterloo Facility Cost Estimate: The cost estimate for the Waterloo facility, as prepared by ERM, is summarized below for comparison.

No.	Activity	Annual Cost	Lifetime Cost
Task 1: Remedy Construction (Year 1)			
1	Pilot Testing	$50,000	$340,000
2	Remedy Construction of Full System	$290,000	*Included in total*
Task 2: Remedy Monitoring – Years 1 – 3			
3	Groundwater, soil vapor, indoor air, and effluent monitoring, reporting, data mgmt.	$48,000	$400,189
4	Monitoring of institutional controls	$1,000	*Included in total*
5	Maintenance of remedial systems	$118,000	*Included in total*
6	Maintenance of monitoring network	$1,000	*Included in total*
Task 3: Site Closure Activities			
7	Monitoring Well Closure (16 wells) at Completion	$32,000	*Included in total*
		Total:	**$740,189**

Booz Allen Cost Estimate: Booz Allen prepared the cost estimate using RACER as the basis of estimate. RACER is a parametric cost-modeling tool that uses typical remediation project data to prepare budget-level cost estimates for planning purposes. The RACER estimating methodology relies on minimal input (primary) parameters, which then generate secondary parameters and cost assemblies. When known (based on information presented in the RIP) or assumed (based on best professional judgment), we adjusted secondary parameters and assemblies to align the cost estimate with planned activities for the Waterloo Facility. The cost estimate is summarized below. Appendices to this document include further detail supporting the RACER cost estimate, including all primary parameters, secondary parameters, and cost assemblies, which were entered or changed.

Booz Allen used RACER Version 11.4.63.0 to prepare the cost estimate for the Waterloo facility. This version of RACER uses a Fiscal Year (FY) 2017 cost basis, which aligns to the cost estimate presented in the RIP, also prepared using a 2017-cost basis.

No.	Activity	Annual Cost*	Lifetime Cost
Task 1: Remedy Construction (Year 1)			
1	Pilot Testing (includes System Design)	$19,329	$19,329
2	Remedy Construction of Full System	$199,525	$199,525
Task 2: Remedy Monitoring – Years 1 – 5			
3	Groundwater, soil vapor, indoor air, and effluent monitoring, reporting, data mgmt.	$115,240	$576,200
4	Monitoring of institutional controls	$9,268	$46,338
5a	Maintenance of DPVE (3 yrs), SSDP (5 years), general maint. & effluent monitoring	$44,944	$224,722
6	Maintenance of monitoring network	*Included in total*	*Included in total*
Task 3: Site Closure Activities			
7	Monitoring Well (24) and DPVE Well (8) Closure at Completion	$28,595	$28,595
8	Confirmatory samples, system dismantling, and site closure reporting	$54,083	$54,083
		Total:	**$1,159,186**

*Represents average annual cost over 5-year period. For Task 2 (Item 3 and Item 5), system operation and monitoring costs incurred will vary depending on scheduled activities for the year, as described in this document and in the RIP.

Issues Identified that Impact the Cost Estimate

- The RIP does not provide a rationale for assuming three years of operation of the DPVE; the timeline seems aggressive for achievement of site closure. Figure 8-1

in the RIP depicts a decision tree for DPVE system operation and shutdown; it shows that three conditions have to be met for system shutdown and site closure:

1. All 17 groundwater monitoring wells identified in Section 4.5 meet the RAOs
   - VOC mass removal rate is less than 10 pounds per day
   - Concentrations in soil confirmation samples are less than RAOs

Meeting these three conditions is more likely to take longer than 3 years of DPVE operations; this presents a major uncertainty in the cost estimate. A more thorough technical evaluation of the anticipated system performance in the RIP is necessary to determine a more appropriate operating period. Such an evaluation was not included in the scope of this task.

- Costs for decommissioning of the DPVE and SSDP systems is not included in Appendix F. For Task 3, closure of the site should entail more than abandonment of monitoring wells; therefore, costs for system dismantling/component disposal, and the development of site closure documentation are included in our cost estimate.
- Implementation of ICs was not costed separately in the Waterloo Facility cost estimate; the value ($1,000) was listed as included in the cost of the other tasks. ICs at the Waterloo Facility are anticipated to include an annual site visit in concurrence with monitoring activities, as well as annual notice letters. These costs are included in the RACER cost estimate as a line item, and not included in the value of other tasks as in the Waterloo Facility cost estimate.
- The cost variance between the Waterloo Facility cost estimate and the RACEr cost estimate for Task 2 is significant and can be attributed to several factors:

1. The off-site disposal of extracted groundwater is a major and highly variable cost element not unqiuely identifyed in the facility cost estimate. Booz Allen assumed the upper end of 0.1 to 0.25 gpm sustained groundwater extraction rate assumed in the RIP Section 7.2 for estimating purposes.
2. IC costs.
3. Annual monitoring costs are anticipated to be at least twice what was estimated by the facility. The faciltiy cost estiamte does not include details or suporting documentation for the development of cost, so the rationale for the variance is unclear.

   Actual monitoring costs can vary depending on the annual modifications made to the program following the decision tree in Figure 5-1 of the RIP. The RACER cost estimate accounts for some variation in monitoring throughout the monitoring program.

Attachment I
RACER Reports

Cost Over Time Report (With Markups)

Folder: Former Waterloo Industries Facility, IA
Facility Name: Former Waterloo Industries — Location: WATERLOO, IA
Facility ID: IAD005277959 — Report Option: Fiscal
Site Name: Former Waterloo Industries
Site Type: None
Site ID: IAD005277959

	Estimator		Reviewer
Name:	Alison Lambert		Ernie Garcia
Title:	Senior Environmental Engineer		Associate
Agency/Org./Office:	Booz Allen Hamilton		Booz Allen Hamilton
Business Address:	112 E. Pecan St. Suite 900 San Antonio, TX 78205		112 E. Pecan St. Suite 900
Phone:	210-487-2589		210-244-4200
Email:	lambert_alison@bah.com		garcia_ernest@bah.com
Prepared Date:		4/10/2017 14:14	4/20/2017 13:07

Phase	Phase Name	Fiscal Year 1 2017	Fiscal Year 2 2018	Fiscal Year 3 2019	Fiscal Year 4 2020	Fiscal Year 5 2021	Row Total
Design	Task 1: Remedy Construction - Design & Pilot Testing	$19,329					$19,329
Remedial Action	Task 1: Remedy Construction of Full System	$199,525					$199,525
Operations & Maintenan	Task 2: Remedy Monitoring and Operation	$212,591	$167,710	$167,710	$154,822	$154,822	$857,653
Site Closeout	Task 3: Site Closure Activities					$82,678	$82,678
Total		$431,445	$167,710	$167,710	$154,822	$237,500	**$1,159,186 Total**

Estimate Documentation Report

System:

RACER Version: RACER® Version 11.4.63.0
Database Location: C:\Users\518166\Documents\EPA\Region 7 TDs\TD 1 Waterloo\Waterloo.mdb

Folder:

Folder Name: test

Facility:

ID: IAD005277959
Name: Former Waterloo Industries TEST
Category: None

Location
State / Country: IOWA
City: WATERLOO

Location Modifier	Default	User	Reason for changes
	1.040	1.040	

Options
Database: System Costs
Cost Database Date: 2017
Report Option: Fiscal

Description: RACER estimate based on RIP dated 8 February 2017

Estimate Documentation Report

Site:

ID: IAD005277959
Name: Former Waterloo Industries
Type: None

Media/Waste Type

Primary: Groundwater
Secondary: Soil

Contaminant

Primary: None
Secondary: None

Phase Names

RCRA Facility Assessment ☐
RCRA Facility Investigation ☑
Corrective Measures Study ☑
Corrective Measures Design ☑
Corrective Measures Implementation ☑
Corrective Measures Operations & Maintenance ☑
Long Term Management ☐
Site Close Out ☑

Documentation

Description: RACER estimate based on Remedy Implementation Plan dated 8 February 2017
Support Team: Booz Allen Hamilton
References: Environmental Resources Management
Remedy Implementation Plan, Former Waterloo Industries Facility
300 Ansborough Avenue, Waterloo, Iowa
IAD005277959
28 November 2016, Revised 8 February 2017
ERM Project No. 0339767

Estimator Information

Estimator Name: Alison Lambert
Estimator Title: Senior Environmental Engineer
Agency/Org./Office: Booz Allen Hamilton
Business Address: 112 E. Pecan St. Suite 900
San Antonio, TX 78205
Telephone Number: 210-487-2589
Email Address: lambert_alison@bah.com
Estimate Prepared Date: 04/10/2017

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name: Ernie Garcia
Reviewer Title: Associate

Estimate Documentation Report

Agency/Org./Office: Booz Allen Hamilton
Business Address: 112 E. Pecan St. Suite 900
San Antonio, TX 78205
Telephone Number: 210-244-4200
Email Address: garcia_ernest@bah.com
Date Reviewed: 04/20/2017

Reviewer Signature: _____ **Date:** _____

Estimate Costs:

Phase Names	Direct Cost	Marked-Up Cost
Task 1: Remedy Construction - Design & Pilot Testing	$19,329	$19,329
Task 1: Remedy Construction of Full System	$156,285	$199,525
Task 2: Remedy Monitoring and Operation	$554,280	$843,169
Task 3: Site Closure Activities	$49,672	$82,678
Total Cost:	$779,566	$1,144,702
Total Project Cost:	$779,566	$1,144,702

Phase Documentation:

Phase Type: Design
Phase Name: Task 1: Remedy Construction - Design & Pilot Testing
Description: .
Approach: Ex Situ
Start Date: October, 2017
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults without Owner Cost

Technology Markups	Markup	% Prime	% Sub.
Remedial Design (Percent)	False	0	0

Total Marked-up Cost: $19,329.11

Technologies:

Estimate Documentation Report

Technology Name: **Remedial Design (Percent) (#2)**

User Name: **Remedial Design (Percent)**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Phase		Task 1: Remedy Construction of Full System	n/a
Approach		Ex Situ	n/a
Phase Costs		175719.19	$
Calculate Design Cost			
Required Parameters			
Phase Date		2016	n/a
Design Approach		Ex Situ Removal - Detailed Design On-site Treatment or Disposal	n/a
Design Percent	11.00	11.00	%
MCC		175719.19	$
Design $		19329.11	$
Year		2017	n/a

Comments:

Technology: Remedial Design (Percent)

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
32039005	Remedial Design - User Defined Cost	1.00	EA	0.00	19,329.11	0.00	0.00	$19,329.11	True

Total Element Cost: $19,329.11

Total 1st Year Tech Cost: $19,329.11

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Task 1: Remedy Construction of Full System
Description: .
Approach: Ex Situ
Start Date: October, 2016
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Estimate Documentation Report

Phase Markup Template: System Defaults without Owner Cost

Technology Markups	Markup	% Prime	% Sub.
Bioslurping	True	100	0
Professional Labor Management	False	0	0
Soil Vapor Extraction	True	100	0
Water Storage Tanks	True	100	0
Residual Waste Management	True	100	0

Total Marked-up Cost: $199,525.19

Technologies:

Technology Name: **Bioslurping (#2)**

User Name: **Bioslurping**

Description	Default	Value	UOM
System Definition			
Required Parameters			
System Type		Dual-Phase Extraction (liquids and air moved by separate pumps / blower)	n/a
Dual-Phase Extraction (liquids and air moved by separate pumps / blower)		Air and Water - Separate Discharge	n/a
Soil Type		Silt/Silty-Clay Mixture	n/a
Formation Type		Unconsolidated	n/a
Depth to Groundwater		14	FT
Surface Area of Contamination		3000	SF
Depth to Base of Contamination		19	FT
Safety Level		D	n/a
Drilling			
Required Parameters			
Average Well Depth		20	FT
Well Diameter		2	IN
Split Spoon Sample Collection		True	n/a
Drum Drill Cuttings		True	n/a
Secondary Parameters			
Drilling Method		Hollow Stem	n/a
Well Construction Material		PVC Schedule 40	n/a
Soil Analytical Templates: Average Number of Samples per Well		0	EA
Soil Analytical Templates: Template		None	n/a

Estimate Documentation Report

Technology Name: **Bioslurping (#2)**

User Name: **Bioslurping**

Description	Default	Value	UOM
Drilling			
Secondary Parameters			
Water Analytical Templates: Average Number of Samples per Well		0	EA
Water Analytical Templates: Template		None	n/a
Pumps / Wells			
Secondary Parameters			
Extraction Well Spacing	22	22	FT
Number of Vapor Extraction Wells	8	8	EA
Average Vapor Flow Rate per Well	6	40	CFM
Total Vapor Flow Rate	48	320	CFM
Vacuum Pump: Quantity	1	1	EA
Vacuum Pump: Capacity	3 HP	3 HP	n/a
Vacuum Pump: Type of Liquid Pump		Submersible	n/a
Screen: Depth to Top	9	9	FT
Screen: Length	11	11	FT
Knockout Drums	1	1	EA
Floor Slab Sawing	0	0	HR
Equipment Enclosure		False	n/a

Comments:

Technology: Bioslurping

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
19010202	Polyvinyl chloride pressure pipe, 1", class 200, SDR 21, includes trenching to 3' deep	136.00	LF	0.34	7.68	8.03	0.00	$2,183.29	False
33010101	Mobilize/DeMobilize Drilling Rig & Crew	1.00	LS	0.00	1,745.01	748.89	0.00	$2,493.90	False
33010421	Disposable Boot Covers (Tyvek)	1.00	PR	3.51	0.00	0.00	0.00	$3.51	False
33010423	Disposable Gloves (Latex)	1.00	PR	0.29	0.00	0.00	0.00	$0.29	False
33010429	Disposable Ear Plugs	1.00	PR	0.15	0.00	0.00	0.00	$0.15	False
33020303	Organic Vapor Analyzer Rental, per Day	2.00	DAY	0.00	0.00	0.00	42.34	$84.69	False
33111301	3 hp Liquid Ring Vacuum Pump	1.00	EA	2,886.00	965.14	0.00	0.00	$3,851.14	False
33111306	Seal Water Tank for Liquid Ring Pump	1.00	EA	311.48	306.22	92.22	0.00	$709.92	False

Estimate Documentation Report

Technology: Bioslurping

33132303	In-Situ Vapor Recovery System, 1 1/2 HP, 230V, 127 SCFM	1.00	EA	4,600.34	1,456.81	0.00	0.00	$6,057.14	False
33132343	DOT steel drums, 55 gal., open, 17C	1.00	EA	106.58	0.00	0.00	0.00	$106.58	False
33170808	Decontaminate Rig, Augers, Screen (Rental Equipment)	2.00	DAY	40.04	691.48	0.00	0.00	$1,463.04	False
33220112	Field Technician	1.00	HR	0.00	48.82	0.00	0.00	$48.82	False
33230101	2" PVC, Schedule 40, Well Casing	96.00	LF	3.02	5.82	4.97	0.00	$1,324.88	False
33230201	2" PVC, Schedule 40, Well Screen	88.00	LF	3.71	5.82	4.97	0.00	$1,275.79	False
33230301	2" PVC, Well Plug	8.00	EA	9.61	17.45	14.90	0.00	$335.71	False
33231101	Hollow Stem Auger, 8" Dia Borehole, Depth <= 100 ft	168.00	LF	0.00	19.45	23.32	0.00	$7,185.97	False
33231172	Split Spoon Sample, 2" x 24", During Drilling	32.00	LF	0.00	0.00	0.00	323.26	$10,344.42	False
33231178	Move Rig/Equipment Around Site	7.00	EA	93.29	250.85	107.65	0.00	$3,162.50	False
33231182	DOT steel drums, 55 gal., open, 17C	9.00	EA	106.58	0.00	0.00	0.00	$959.21	False
33231193	Well Development Equipment Rental (Daily)	2.00	DAY	0.00	0.00	0.00	60.14	$120.29	False
33231401	2" Screen, Filter Pack	104.00	LF	5.46	4.49	3.84	0.00	$1,433.69	False
33231502	Surface Pad, Concrete, 4' x 4' x 4"	8.00	EA	82.26	30.19	2.92	0.00	$923.02	False
33231811	2" Well, Portland Cement Grout	48.00	LF	5.95	0.00	0.00	0.00	$285.73	False
33232101	2" Well, Bentonite Seal	8.00	EA	14.96	116.02	99.10	0.00	$1,840.63	False
33260410	1" PVC, Schedule 40, Connection Piping	400.00	LF	1.06	5.01	0.00	0.00	$2,428.22	False
33260458	2" PVC, Schedule 80, Manifold Piping	264.00	LF	2.86	11.53	0.00	0.00	$3,799.11	False
33270101	1" PVC, Schedule 40, Tee	8.00	EA	1.34	51.90	0.00	0.00	$425.91	False
33270111	1" PVC, Schedule 40, 90 Degree, Elbow	8.00	EA	1.01	34.67	0.00	0.00	$285.41	False
33270124	2" PVC, Schedule 80, Tee	8.00	EA	32.76	73.80	0.00	0.00	$852.44	False
33270134	2" PVC, Schedule 80, 90 Degree, Elbow	16.00	EA	9.20	44.59	0.00	0.00	$860.69	False
33270440	2" PVC, Sch 80, Ball Valve	8.00	EA	20.33	50.86	0.00	0.00	$569.55	False
33310209	Pressure Gauge	8.00	EA	128.70	90.28	0.00	0.00	$1,751.84	False

Total Element Cost: $57,167.49

Estimate Documentation Report

Total 1st Year Tech Cost: $57,167.49

Technology Name: **Professional Labor Management (#2)**

User Name: **Professional Labor Management**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Markedup Construction Cost ($)		119626.00	$
Percentage	19.90	19.90	%
Dollar Amount		23806.00	$

Comments:

Technology: Professional Labor Management

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220149	Lump Sum Percentage Labor Cost	1.00	LS	0.00	23,806.00	0.00	0.00	$23,806.00	True

Total Element Cost: $23,806.00

Total 1st Year Tech Cost: $23,806.00

Technology Name: **Residual Waste Management (#2)**

User Name: **Residual Waste Management**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Safety Level		D	n/a
Non-Rad Disposal			
Required Parameters			
Waste Type/ Condition		Non-Hazardous Drums	n/a
Total Quantity		15	Units
Units		Drums	-
Stabilization		False	n/a
Transportation Type		Truck	n/a
Distance 1		115	MI
Distance 2		0	MI

Comments:

Technology: Residual Waste Management

Estimate Documentation Report

Technology: Residual Waste Management

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33190103	Load Drums on Disposal Vehicle	15.00	EA	0.00	6.46	1.83	0.00	$124.40	False
33190204	Transport 55 Gallon Drums of Hazardous Waste, Max 80 drums (per Mile)	115.00	MI	0.00	0.00	0.00	2.31	$265.51	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	52.00	$52.00	False
33197205	Landfill Nonhazardous Solid Waste, 55 Gallon Drum	15.00	EA	0.00	0.00	0.00	135.20	$2,028.00	False

Total Element Cost: $2,469.91

Total 1st Year Tech Cost: $2,469.91

Technology Name: **Soil Vapor Extraction (#2)**

User Name: **Soil Vapor Extraction**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Installation Type		Vertical Wells	n/a
Soil Type		Silt/Silty-Clay Mixture	n/a
Surface Area of Contamination		100	SF
Depth to Base of Contamination		5	FT
Safety Level		D	n/a
Drilling			
Required Parameters			
Average Well Depth		5	LF
Formation Type		Unconsolidated	n/a
Drilling Method		Hollow Stem	n/a
Well Diameter		4 Inch	n/a
Well Construction Material		PVC Schedule 40	n/a
Split Spoon Sample Collection		False	n/a
Average Number of Soil Samples per Well		0	EA
Soil Analytical Template		None	n/a
Drilling Safety Level		D	n/a
Vertical Wells			
Secondary Parameters			
Vertical Well: Extraction Well Spacing	22	22	FT
Vertical Well: Number of Vapor Extraction Wells	1	1	EA

Estimate Documentation Report

Technology Name: **Soil Vapor Extraction (#2)**

User Name: **Soil Vapor Extraction**

Description	Default	Value	UOM
Vertical Wells			
Secondary Parameters			
Vertical Well: Average Vapor Flow Rate per Well	6	6	CFM
Vertical Well: Total Vapor Flow Rate	6	6	CFM
Vertical Well: Knockout Drums	0	0	EA
Vertical Well: Floor Slab Sawing	0	4	HR
n/a			
Secondary Parameters			
Equipment Enclosure Visibility		True	n/a

Comments:

Technology: Soil Vapor Extraction

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
09040732	0.17 m3/s(350 CFM) Exhaust Fan	1.00	EA	2,735.38	2,415.18	0.00	0.00	$5,150.56	False
33010101	Mobilize/DeMobilize Drilling Rig & Crew	1.00	LS	0.00	1,745.01	748.89	0.00	$2,493.90	False
33020303	Organic Vapor Analyzer Rental, per Day	1.00	DAY	0.00	0.00	0.00	42.34	$42.34	False
33020620	Soil Gas Vapor Probe, Stainless Steel, Manual, Nonremovable Tip	4.00	EA	366.50	0.00	0.00	0.00	$1,465.98	False
33132302	In-Situ Vapor Recovery System, 1 HP, 230V, 98 SCFM	1.00	EA	11,063.99	1,456.81	0.00	0.00	$12,520.79	False
33132377	Equipment Enclosure, 8' x 15', Portable Building/Shed; lined, insulated, skid mounted, w/exhaust fan	1.00	EA	2,496.00	1,037.59	0.00	0.00	$3,533.59	False
33170808	Decontaminate Rig, Augers, Screen (Rental Equipment)	1.00	DAY	40.04	691.48	0.00	0.00	$731.52	False
33179104	Sawing of Floor Slabs	4.00	HR	0.00	215.52	48.62	0.00	$1,056.55	False
33220112	Field Technician	16.00	HR	0.00	48.82	0.00	0.00	$781.07	False
33230202	4" PVC, Schedule 40, Well Screen	5.00	LF	8.92	8.73	7.45	0.00	$125.50	False
33231103	Hollow Stem Auger, 11" Dia Borehole, Depth <= 100 ft	6.00	LF	0.00	23.77	28.50	0.00	$313.62	False

Estimate Documentation Report

Technology: Soil Vapor Extraction

33231182	DOT steel drums, 55 gal., open, 17C	1.00	EA	106.58	0.00	0.00	0.00	$106.58	False
33231402	4" Screen, Filter Pack	7.00	LF	9.42	7.75	6.62	0.00	$166.56	False
33232102	4" Well, Bentonite Seal	1.00	EA	213.72	174.50	149.05	0.00	$537.27	False
33260428	2" PVC, Schedule 80, Connection Piping	16.50	LF	2.86	11.53	0.00	0.00	$237.44	False
33270124	2" PVC, Schedule 80, Tee	1.00	EA	32.76	73.80	0.00	0.00	$106.56	False
33270134	2" PVC, Schedule 80, 90 Degree, Elbow	1.00	EA	9.20	44.59	0.00	0.00	$53.79	False
33270440	2" PVC, Sch 80, Ball Valve	1.00	EA	20.33	50.86	0.00	0.00	$71.19	False
33310101	300 CFM Blower System, 7" Pressure, 3/4 HP	1.00	EA	1,035.34	375.19	0.00	0.00	$1,410.53	False
33310209	Pressure Gauge	1.00	EA	128.70	90.28	0.00	0.00	$218.98	False

Total Element Cost: $31,124.33

Total 1st Year Tech Cost: $31,124.33

Technology Name: **Water Storage Tanks (#2)**

User Name: **Water Storage Tanks**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Elevation		Above Ground	n/a
Number of Tanks		1	EA
Type of Tank		18,927 L (5,000 GAL) Elev. Steel Tank on Towers	n/a
Safety Level		D	n/a

Comments:

Technology: Water Storage Tanks

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
19010325	5,000 Gallon Water Tank, Elevated Steel on Towers	1.00	EA	37,856.00	3,462.00	399.37	0.00	$41,717.36	False

Total Element Cost: $41,717.36

Total 1st Year Tech Cost: $41,717.36

Estimate Documentation Report

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: Task 2: Remedy Monitoring and Operation
Description: .

Approach: Ex Situ
Start Date: October, 2016
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markup Template: System Defaults without Owner Cost

Technology Markups	Markup	% Prime	% Sub.
MONITORING	True	100	0
ADMINISTRATIVE LAND USE CONTROLS	True	100	0
Operations and Maintenance	True	100	0
Residual Waste Management	True	100	0

Total Marked-up Cost: $843,169.46

Technologies:

Technology Name: **Administrative Land Use Controls (#2)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		False	n/a
Planning Documents: Start Date		2018	n/a
Implementation		False	n/a
Implementation: Start Date		2018	n/a
Monitoring & Enforcement		True	n/a
Monitoring & Enforcement: Start Date		2017	n/a
Modification/Termination		False	n/a
Modification/Termination: Start Date		2017	n/a
Type of Site		Private/Other	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		5	Years

Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (#2)**

User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	Default	Value	UOM
Monitoring & Enforcement			
Required Parameters			
Notice Letters		True	n/a
Notice Letters: Number		1	EA
Notice Letters: Frequency		Annually	n/a
Guard Service/Security		False	n/a
Guard Service/Security: Number		0	EA
Reports & Certifications		False	n/a
Site Visits/Inspections		True	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		0	MI

Comments:

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Monitoring & Enforcement

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010202	Per Diem (per person)	0.00	DAY	0.00	0.00	0.00	140.77	$0.00	True
33022038	Overnight delivery service, 1 lb package	3.00	LB	0.00	0.00	0.00	54.50	$163.49	False
33220102	Project Manager	0.00	HR	0.00	105.90	0.00	0.00	$0.00	False
33220106	Staff Engineer	33.00	HR	0.00	96.30	0.00	0.00	$3,177.95	False
33220110	QA/QC Officer	2.00	HR	0.00	61.92	0.00	0.00	$123.84	False
33220114	Word Processing/Clerical	2.00	HR	0.00	49.56	0.00	0.00	$99.13	False
33220119	Health and Safety Officer	1.00	HR	0.00	79.85	0.00	0.00	$79.85	False
33240101	Other Direct Costs	1.00	LS	126.73	0.00	0.00	0.00	$126.73	True

Total Element Cost: $3,770.99

Total 1st Year Tech Cost: $3,770.99

Estimate Documentation Report

Technology Name: **Monitoring (#2)**

User Name: **MONITORING**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Model Name		Monitoring	n/a
Groundwater		True	n/a
Surface Soil		False	n/a
Surface Water		False	n/a
Subsurface Soil		False	n/a
Sediment		False	n/a
Soil Gas		True	n/a
Air		True	n/a
Site Distance (One-way)		115	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		30	FT
Samples per Event (First Year)		24	EA
Samples per Event (Out Years)		24	EA
Number of Events (First Year)		2	EA
Number of Events (Out Years)		2	EA
Number of Years (Out Years)		4	EA
Secondary Parameters			
Primary Analytical Template	None	Waterloo Analyses	n/a
Secondary Analytical Template	None	None	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	8	8	EA
Contain Purge Water	Yes	Yes	n/a
Soil Gas			
Required Parameters			
Samples per Event (First Year)		2	EA
Samples per Event (Out Years)		2	EA
Number of Events (First Year)		2	EA
Number of Events (Out Years)		2	EA
Number of Years (Out Years)		4	EA
Secondary Parameters			
Primary Analytical Template	None	System Air Emissions - VOCs	n/a
Secondary Analytical Template	None	None	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Passive Absorbers	Passive Absorbers	n/a
Number of Samples/Day	12	12	EA

Estimate Documentation Report

Technology Name: **Monitoring (#2)**

User Name: **MONITORING**

Description	Default	Value	UOM
Air			
Required Parameters			
Samples per Event (First Year)		2	EA
Samples per Event (Out Years)		2	EA
Number of Events (First Year)		2	EA
Number of Events (Out Years)		2	EA
Number of Years (Out Years)		4	EA
Secondary Parameters			
Primary Analytical Template	None	System Air Emissions - VOCs	n/a
Secondary Analytical Template	None	None	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Vacuum Pump	Vacuum Pump	n/a
Number of Samples/Day	16	16	EA
QA/QC			
Secondary Parameters			
Split Samples	10	0	EA
Field Duplicate Samples	10	10	EA
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	20	20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

Technology: MONITORING

Element: Groundwater

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33020401	Disposable Materials per Sample	64.00	EA	9.95	0.00	0.00	0.00	$636.91	False
33020402	Decontamination Materials per Sample	64.00	EA	17.65	0.00	0.00	0.00	$1,129.52	False
33020561	Lysimeter accessories, nylon tubing, 1/4" OD	1,465.00	LF	0.43	0.00	0.00	0.00	$624.68	False
33021509	Monitor well sampling equipment, rental, water quality testing	2.00	WK	0.00	0.00	0.00	301.60	$603.20	False

Estimate Documentation Report

Technology: MONITORING

	parameter device rental								
33021602	Testing, soil & sediment analysis, pH, electrometric (9045)	10.00	EA	0.00	0.00	0.00	18.76	$187.62	False
33021603	Testing, dissolved solids	10.00	EA	0.00	0.00	0.00	21.74	$217.36	False
33021608	Testing, nitrogen, nitrate/nitrite	10.00	EA	0.00	0.00	0.00	44.62	$446.16	False
33021609	Testing, acidity/alkalinity	10.00	EA	0.00	0.00	0.00	27.83	$278.34	False
33021618	Testing, purgeable organics (624, 8260)	64.00	EA	0.00	0.00	0.00	183.04	$11,714.56	False
33021620	Testing, TAL metals (6010/7000s)	10.00	EA	0.00	0.00	0.00	197.05	$1,970.54	False
33021653	Testing, chloride	10.00	EA	0.00	0.00	0.00	28.60	$286.00	False
33021663	Testing, dissolved oxygen (DO)	10.00	EA	0.00	0.00	0.00	21.45	$214.50	False
33021668	Testing, sulfur: sulfate, sulfide, sulfite	10.00	EA	0.00	0.00	0.00	37.75	$377.52	False
33021673	Testing, total organic carbons	10.00	EA	0.00	0.00	0.00	60.06	$600.60	False
33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1.00	EA	0.00	0.00	0.00	117.00	$117.00	False
33022153	Dissolved gases (EPA RSK-175)	10.00	EA	0.00	0.00	0.00	114.40	$1,144.00	False
33220102	Project Manager	8.00	HR	0.00	105.90	0.00	0.00	$847.22	False
33220112	Field Technician	128.00	HR	0.00	48.82	0.00	0.00	$6,248.52	False
33230614	Peristaltic Pump, Weekly Rental	2.00	WK	0.00	0.00	0.00	99.32	$198.64	False

Total Element Cost: $27,842.88

Element: Soil Gas

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33020306	Monitoring Gas Vents	4.00	EA	0.00	0.00	0.00	13.97	$55.90	False
33020307	Soil gas investigation & analysis, equipment rental	2.00	DAY	0.00	0.00	0.00	182.00	$364.00	False
33020401	Disposable Materials per Sample	10.00	EA	9.95	0.00	0.00	0.00	$99.52	False
33020402	Decontamination Materials per Sample	10.00	EA	17.65	0.00	0.00	0.00	$176.49	False
33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	10.00	EA	0.00	0.00	0.00	17.16	$171.60	False

Estimate Documentation Report

Technology: MONITORING

33021834	Volatile Organic Compounds (TO-14)	10.00	EA	0.00	0.00	0.00	245.96	$2,459.60	False
33220102	Project Manager	3.00	HR	0.00	105.90	0.00	0.00	$317.71	False
33220112	Field Technician	40.00	HR	0.00	48.82	0.00	0.00	$1,952.66	False

Total Element Cost: $5,597.48

Element: Air

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33020345	Portable Air Sampler, Continuous, Daily Rental	2.00	DAY	0.00	0.00	0.00	32.14	$64.29	False
33020401	Disposable Materials per Sample	10.00	EA	9.95	0.00	0.00	0.00	$99.52	False
33020402	Decontamination Materials per Sample	10.00	EA	17.65	0.00	0.00	0.00	$176.49	False
33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	10.00	EA	0.00	0.00	0.00	17.16	$171.60	False
33021834	Volatile Organic Compounds (TO-14)	10.00	EA	0.00	0.00	0.00	245.96	$2,459.60	False
33220102	Project Manager	3.00	HR	0.00	105.90	0.00	0.00	$317.71	False
33220112	Field Technician	38.00	HR	0.00	48.82	0.00	0.00	$1,855.03	False

Total Element Cost: $5,144.23

Element: Data Management

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	14.00	HR	0.00	105.90	0.00	0.00	$1,482.63	False
33220105	Project Engineer	30.00	HR	0.00	73.14	0.00	0.00	$2,194.27	False
33220108	Project Scientist	85.00	HR	0.00	79.64	0.00	0.00	$6,769.07	False
33220109	Staff Scientist	80.00	HR	0.00	64.32	0.00	0.00	$5,145.21	False
33220110	QA/QC Officer	22.00	HR	0.00	75.51	0.00	0.00	$1,661.31	False
33220112	Field Technician	6.00	HR	0.00	48.82	0.00	0.00	$292.90	False
33220114	Word Processing/Clerical	18.00	HR	0.00	49.56	0.00	0.00	$892.17	False
33220115	Draftsman/CADD	14.00	HR	0.00	47.16	0.00	0.00	$660.17	False

Total Element Cost: $19,097.73

Element: General Monitoring

								Extended Cost	Cost

Estimate Documentation Report

Technology: MONITORING

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Cost	Override
33010104	Sample collection, vehicle mileage charge, car or van	760.00	MI	0.00	0.00	0.00	0.56	$425.60	True
33010202	Per Diem (per person)	20.00	DAY	0.00	0.00	0.00	140.77	$2,815.40	True
33022043	Overnight delivery service, 51 to 70 lb packages	3,000.00	LB	0.00	0.00	0.00	7.78	$23,337.60	False
33220112	Field Technician	47.00	HR	0.00	48.82	0.00	0.00	$2,294.38	False

Total Element Cost: $28,872.98

Total 1st Year Tech Cost: $86,555.30

Technology Name: **Operations and Maintenance (#2)**

User Name: **Operations and Maintenance**

Description	Default	Value	UOM
Labor			
Secondary Parameters			
Operations Labor: Type	Minimum	Exclude from Estimate	n/a
Professional Labor: Type	Exclude from Estimate	Exclude from Estimate	n/a
Analytical			
Secondary Parameters			
Wastewater/Effluent: Sampling Frequency	Monthly	Exclude from Estimate	n/a
Wastewater/Effluent: Primary Analytical Template	System - Wastewater Effluent	System - Wastewater Effluent	n/a
Wastewater/Effluent: Secondary Analytical Template	None	None	n/a
Air Emissions: Sampling Frequency	Annually	Bi-Weekly	n/a
Air Emissions: Primary Analytical Template	System Air Emissions - VOCs	System Air Emissions - VOCs	n/a
Air Emissions: Secondary Analytical Template	None	None	n/a
Solid Wastes: Sampling Frequency	Exclude from Estimate	Exclude from Estimate	n/a
Solid Wastes: Primary Analytical Template	None	None	n/a
Solid Wastes: Secondary Analytical Template	None	None	n/a
Heating Requirements			
Secondary Parameters			
Air Streams: Flow Rate	16	16	CFM
Air Streams: Temperature Difference	0	0	F
Air Streams: Months per Year	0	0	Month
Water Streams: Flow Rate	16	16	CFM
Water Streams: Temperature Difference	0	0	F
Water Streams: Months per Year	0	0	Month
Facility: Area	0	0	SF
Facility: Temperature Difference	0	0	F
Facility: Months per Year	0	0	Month

Estimate Documentation Report

Comments:

Technology: Operations and Maintenance

Element: Misc. Support Cost

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33020345	Portable Air Sampler, Continuous, Daily Rental	52.00	DAY	0.00	0.00	0.00	32.14	$1,671.49	False
33020401	Disposable Materials per Sample	29.00	EA	9.95	0.00	0.00	0.00	$288.60	False
33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	29.00	EA	0.00	0.00	0.00	15.60	$452.40	False
33021834	Volatile Organic Compounds (TO-14)	29.00	EA	0.00	0.00	0.00	223.60	$6,484.40	False
33022042	Overnight delivery service, 21 to 50 lb packages	910.00	LB	0.00	0.00	0.00	6.62	$6,028.57	False
33220102	Project Manager	3.00	HR	0.00	105.90	0.00	0.00	$317.71	False
33220108	Project Scientist	59.00	HR	0.00	79.64	0.00	0.00	$4,698.53	False
33220110	QA/QC Officer	2.00	HR	0.00	75.51	0.00	0.00	$151.03	False
33220112	Field Technician	6.00	HR	0.00	48.82	0.00	0.00	$292.90	False
33220114	Word Processing/Clerical	6.00	HR	0.00	49.56	0.00	0.00	$297.39	False
33223001	Treatment System Operator	48.00	HR	0.00	91.09	0.00	0.00	$4,372.26	False
33240101	Other Direct Costs	1.00	LS	253.25	0.00	0.00	0.00	$253.25	True

Total Element Cost: $25,308.52

Element: Bioslurping

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33140303	HTTD, bulk liquid haz waste, off-site	0.00	GAL	0.00	0.00	0.00	3.28	$0.00	False
33190207	Transport Bulk Liquid/Sludge Hazardous Waste, Maximum 5,000 Gallon (per Mile)	1,380.00	MI	0.00	0.00	0.00	2.79	$3,846.34	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	12.00	EA	0.00	0.00	0.00	52.00	$624.00	False
33420101	Electrical Charge	17,778.26	KWH	0.14	0.00	0.00	0.00	$2,403.62	False

Estimate Documentation Report

Total Element Cost: $6,873.96

Element: Soil Vapor Extraction

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33190103	Load Drums on Disposal Vehicle	0.00	EA	0.00	6.46	1.83	0.00	$0.00	False
33190303	Minimum Charges for Drummed Shipments	0.00	EA	0.00	0.00	0.00	210.77	$0.00	False
33190403	DOT steel drums, 55 gal., closed only, 17H	0.00	EA	91.24	0.00	0.00	0.00	$0.00	False
33197102	Wastewater Disposal Fee	0.00	KGA	0.00	0.00	0.00	3.85	$0.00	False
33420101	Electrical Charge	223.38	KWH	0.14	0.00	0.00	0.00	$30.20	False

Total Element Cost: $30.20

Total 1st Year Tech Cost: $32,212.68

Technology Name: **Residual Waste Management (#2)**

User Name: **Residual Waste Management**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Safety Level		D	n/a
Non-Rad Disposal			
Required Parameters			
Waste Type/ Condition		Non-Hazardous Bulk Liquid	n/a
Total Quantity		7520	Units
Units		GAL	-
Stabilization		False	n/a
Transportation Type		Truck	n/a
Distance 1		115	MI
Distance 2		0	MI

Comments:

Technology: Residual Waste Management

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33190101	Liquid Loading Into 5,000 Gallon Bulk Tank Truck	2.00	EA	0.00	619.44	325.27	0.00	$1,889.41	False
33190108	Tanker Pumping	3.00	HR	0.00	0.00	0.00	28.95	$86.86	False

Technology: Residual Waste Management

	Equipment to Load Liquid								
33190207	Transport Bulk Liquid/Sludge Hazardous Waste, Maximum 5,000 Gallon (per Mile)	230.00	MI	0.00	0.00	0.00	2.79	$641.06	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	52.00	$52.00	False
33197274	Commercial RCRA landfills, regional outline, liquid, non-hazardous	7,520.00	GAL	0.00	0.00	0.00	0.86	$6,491.26	False

Total Element Cost: $9,160.60

Total 1st Year Tech Cost: $9,160.60

Phase Documentation:

Phase Type: Site Closeout
Phase Name: Task 3: Site Closure Activities
Description: .
Approach: Ex Situ
Start Date: October, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markup Template: System Defaults without Owner Cost

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0
System Dismantling	True	100	0
MONITORING	True	100	0
Well Abandonment	True	100	0

Total Marked-up Cost: $82,678.10

Technologies:

Estimate Documentation Report

Technology Name: **Monitoring (#2)**

User Name: **MONITORING**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Model Name		Monitoring	n/a
Groundwater		False	n/a
Surface Soil		False	n/a
Surface Water		False	n/a
Subsurface Soil		True	n/a
Sediment		False	n/a
Soil Gas		False	n/a
Air		False	n/a
Site Distance (One-way)		115	MI
Safety Level		D	n/a
Subsurface Soil			
Required Parameters			
Average Sample Depth		5	FT
Samples per Event (First Year)		4	EA
Samples per Event (Out Years)		0	EA
Number of Events (First Year)		1	EA
Number of Events (Out Years)		0	EA
Number of Years (Out Years)		0	EA
Secondary Parameters			
Primary Analytical Template	None	System Soil - VOCs	n/a
Secondary Analytical Template	None	None	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Power Auger	Direct Push Rig	n/a
Number of Samples/Day	12	12	EA
QA/QC			
Secondary Parameters			
Split Samples	10	0	EA
Field Duplicate Samples	10	10	EA
Rinse Blanks (per Round)	0	0	EA
Trip Blanks (per Day)	1	0	EA
Matrix Spikes/Matrix Spike Duplicates	20	0	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	None	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	None	n/a

Comments:

Estimate Documentation Report

Technology: MONITORING

Element: Subsurface Soil

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33020401	Disposable Materials per Sample	5.00	EA	9.95	0.00	0.00	0.00	$49.76	False
33020402	Decontamination Materials per Sample	5.00	EA	17.65	0.00	0.00	0.00	$88.24	False
33020667	Direct Push Rig, Truck Mounted, Non Hydraulic, Includes Labor, Sampling, Decontamination	1.00	DAY	0.00	0.00	0.00	1,560.00	$1,560.00	False
33020668	Mobilize Direct Push Rig and Crew	0.00	DAY	0.00	0.00	0.00	1,560.00	$0.00	False
33020669	Demobilize Direct Push Rig and Crew	0.00	EA	1,560.00	0.00	0.00	0.00	$0.00	False
33020671	En Core Soil Sampler (5 or 25 gram)	5.00	EA	8.53	0.00	0.00	0.00	$42.64	False
33021720	Testing, purgeable organics (624, 8260)	5.00	EA	0.00	0.00	0.00	183.04	$915.20	False
33220102	Project Manager	0.00	HR	0.00	105.90	0.00	0.00	$0.00	False
33220112	Field Technician	20.00	HR	0.00	48.82	0.00	0.00	$976.33	False

Total Element Cost: $3,632.17

Element: Data Management

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220108	Project Scientist	14.00	HR	0.00	79.64	0.00	0.00	$1,114.91	False

Total Element Cost: $1,114.91

Element: General Monitoring

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010104	Sample collection, vehicle mileage charge, car or van	0.00	MI	0.00	0.00	0.00	0.56	$0.00	True
33010202	Per Diem (per person)	0.00	DAY	0.00	0.00	0.00	140.77	$0.00	True
33022043	Overnight delivery service, 51 to 70 lb packages	60.00	LB	0.00	0.00	0.00	7.78	$466.75	False
33220112	Field Technician	19.00	HR	0.00	48.82	0.00	0.00	$927.52	False

Total Element Cost: $1,394.27

Estimate Documentation Report

Total 1st Year Tech Cost: $6,141.35

Technology Name: **Site Close-Out Documentation (#2)**

User Name: **Site Close-Out Documentation**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Meetings		True	n/a
Work Plans and Reports		True	n/a
Documents		False	n/a
Site Close-Out Complexity		Low	n/a
Meetings			
Required Parameters			
Kick Off/Scoping Meetings		False	n/a
Kick Off/Scoping Meetings: Number of Meetings		0	EA
Kick Off/Scoping Meetings: Travel		False	n/a
Kick Off/Scoping Meetings: Travelers		0	EA
Kick Off/Scoping Meetings: Days		0	Days
Kick Off/Scoping Meetings: Air Fare		0.00	$
Review Meetings		False	n/a
Review Meetings: Number of Meetings		0	EA
Review Meetings: Travel		False	n/a
Review Meetings: Travelers		0	EA
Review Meetings: Days		0	Days
Review Meetings: Air Fare		0.00	$
Regulatory Review Meetings		True	n/a
Regulatory Review Meetings: Number of Meetings	1	1	EA
Regulatory Review Meetings: Travel		False	n/a
Regulatory Review Meetings: Travelers		0	EA
Regulatory Review Meetings: Days		0	Days
Regulatory Review Meetings: Air Fare		0.00	$
Work Plans & Reports			
Required Parameters			
Work Plans		True	n/a
Draft Work Plan		True	n/a
Final Work Plan		True	n/a
Reports		True	n/a
Draft Close-Out Report		True	n/a
Draft Final Close-Out Report		True	n/a
Final Close-Out Report		True	n/a
Progress Reports		False	n/a
Project Duration	0	0	months

Comments:

Technology: Site Close-Out Documentation

Estimate Documentation Report

Technology: Site Close-Out Documentation

Element: Meetings

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220102	Project Manager	5.00	HR	0.00	105.90	0.00	0.00	$529.51	False
33220106	Staff Engineer	7.00	HR	0.00	96.30	0.00	0.00	$674.11	False
33220114	Word Processing/Clerical	2.00	HR	0.00	49.56	0.00	0.00	$99.13	False
33220115	Draftsman/CADD	1.00	HR	0.00	47.16	0.00	0.00	$47.16	False

Total Element Cost: $1,349.91

Element: Work Plans & Reports

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	7.00	HR	0.00	115.16	0.00	0.00	$806.13	False
33220102	Project Manager	53.00	HR	0.00	105.90	0.00	0.00	$5,612.83	False
33220104	Senior Staff Engineer	4.00	HR	0.00	114.13	0.00	0.00	$456.53	False
33220109	Staff Scientist	2.00	HR	0.00	64.32	0.00	0.00	$128.63	False
33220114	Word Processing/Clerical	41.00	HR	0.00	49.56	0.00	0.00	$2,032.16	False
33220115	Draftsman/CADD	6.00	HR	0.00	47.16	0.00	0.00	$282.93	False

Total Element Cost: $9,319.21

Total 1st Year Tech Cost: $10,669.12

Technology Name: **User Defined Estimate (#2)**

User Name: **System Dismantling**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Model Name		System Dismantling	n/a
WBS Type		HTRW	n/a
Selected WBS		342.91.91	n/a
Safety Level		D	n/a

Comments:

Technology: System Dismantling

Element:

Estimate Documentation Report

Technology: System Dismantling

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
16010290	Remove Misc. (2 Laborers)	16.00	HR	0.00	164.73	0.00	0.00	$2,635.68	False
33190342	Drummed Site Waste Disposal, Non Haz	4.00	EA	0.00	0.00	0.00	2,704.00	$10,816.00	False
33190402	DOT steel drums, 55 gal., open only, 17H	4.00	EA	66.50	0.00	0.00	0.00	$265.99	False

Total Element Cost:	$13,717.67
Total 1st Year Tech Cost:	$13,717.67

Technology Name: **Well Abandonment (#2)**

User Name: **Well Abandonment**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Safety Level		D	n/a
Abandon Wells			
Required Parameters			
Technology/Group Name		Bioslurping	n/a
Number of Wells	8	8	n/a
Well Depth		20	FT
Well Diameter		2	IN
Well Abandonment Method		Abandon In-Place	n/a
Formation Type		Unconsolidated	n/a
Karst Formation Type		False	n/a
System Definition			
Required Parameters			
Safety Level		D	n/a
Abandon Wells			
Required Parameters			
Technology/Group Name		Soil Vapor Extraction	n/a
Number of Wells	1	1	n/a
Well Depth		5	FT
Well Diameter		4	IN
Formation Type		Unconsolidated	n/a
Karst Formation Type		False	n/a
System Definition			
Required Parameters			
Safety Level		D	n/a
Abandon Wells			
Required Parameters			
Technology/Group Name		Deep Wells	n/a

Estimate Documentation Report

Technology Name: **Well Abandonment (#2)**

User Name: **Well Abandonment**

Description	Default	Value	UOM
Abandon Wells			
Required Parameters			
Number of Wells	15	15	n/a
Well Depth		45	FT
Well Diameter		2	IN
Well Abandonment Method		Abandon In-Place	n/a
Formation Type		Unconsolidated	n/a
Karst Formation Type		False	n/a
System Definition			
Required Parameters			
Safety Level		D	n/a
Abandon Wells			
Required Parameters			
Technology/Group Name		Shallow Wells	n/a
Number of Wells	7	7	n/a
Well Depth		25	FT
Well Diameter		2	IN
Well Abandonment Method		Abandon In-Place	n/a
Formation Type		Unconsolidated	n/a
Karst Formation Type		False	n/a

Comments:

Technology: Well Abandonment

Element:

Assembly	Description	QTY	UOM	Mat Cost	Lab Cost	Eqp Cost	Sub Bid Cost	Extended Cost	Cost Override
33010101	Mobilize/DeMobilize Drilling Rig & Crew	1.00	LS	0.00	1,745.01	748.89	0.00	$2,493.90	False
33220112	Field Technician	48.00	HR	0.00	48.82	0.00	0.00	$2,343.20	False
33231178	Move Rig/Equipment Around Site	30.00	EA	93.29	250.85	107.65	0.00	$13,553.58	False
33231820	Grout Continuous Borehole	21.00	CF	35.86	0.00	0.00	0.00	$753.04	False

Total Element Cost: $19,143.71

Total 1st Year Tech Cost: $19,143.71